Sincock, Jennifer

From: Everett, Alan <aeverett@pa.gov>
Sent: Thursday, May 21, 2015 1:29 PM
To: Richardson, William
Subject: FW: Comments - Nutrient Impact Assessment Protocol
Attachments: ChesterWatershedDielOxygen.xlsx; CooksWissahickonDielDOComparisonApril2013Summary.xlsx

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From: Everett, Alan
Sent: Thursday, May 21, 2015 1:28 PM
To: McGarrell, Charles A
Cc: Spear, Richard; Brown, Will; Fields, Jenifer
Subject: Comments - Nutrient Impact Assessment Protocol

Hi Charlie,

Thanks for giving SERO the opportunity to comment on the draft DEP Nutrient Assessment Protocol document (technical and condensed). And thank you for your work on this, I think you have moved our ability to list and defend nutrient impairments forward. I think the document is well written. The screening benchmarks and the use of diel DO as an ecosystem response (rough measure of community productivity/respiration) provides a good cost effective framework for determining nutrient cause listings in ALU impaired waters. My understanding is that this will be interim guidance as DEP develops nutrient criteria and develops additional nutrient enrichment indicators (ea. algal assemblage response to nutrients). I suspect that this protocol underestimates nutrient impairment in PA (false negatives). I think this document will be helpful for us in the SE. Most of my comments are minor, however I do have a significant concern relative to the exclusion of point or discrete DO measurements for the determination of delta DO and the minimum number of max diel DO range values required by the protocol (first two bullets below):

- **Maximum Diel Dissolved Oxygen Range (Tier 2 Benchmark)** – By definition the maximum diel dissolved oxygen range is the largest dissolved oxygen difference at a station within a 24 hour period. Discrete (point) DO data collected in the early morning and late afternoon at a station provides defensible delta DO values that can be compared to the Tier 2 Benchmark. Both sonde data and discrete data collected using either optical or electrochemical in-situ DO sensors would provide adequate data for assessment of nutrient impairment using the Tier 2 Benchmark. The determination of the type of in-situ DO monitoring should be left to the biologist conducting the assessment survey. I have attached Chester Creek Watershed Tier 1 nutrient data and discrete DO data that, I think, shows the applicability of discrete data for comparison with the Tier 2 benchmark. Continuous monitoring is resource intensive (equipment, man-hours, processing). Discrete monitoring, given limited resources, allows for targeting of more stations during short-term critical index periods (high PAR, preceding stable flow) when algal productivity and overall community respiration should be maximized. If your concern is data quality, discrete DO sampling utilizing optical or electrochemical sensors would provide comparable quality to sonde data, in fact, the CIM protocol relies on in-situ discrete side-by-side DO measurements to account for sonde drift and fouling. Additionally, during point sampling, the biologist is present in-stream at the time of the maximum DO swing and can visually note periphyton conditions. In the Chester Creek Watershed example, I think three stations (CC-Dil, CC-Dar, and WBrCC-Ivy) show sufficient nutrient concentration and max delta DO data to warrant the listing of nutrients as a cause of impairment.

- **Minimum number of max diel DO range values** – There have been considerable changes in the draft document regarding the minimum number of max diel values required by the benchmark. I don't think the changes are

supported by the data you reviewed. Currently the protocol lists a minimum of 3 "approved" continuously monitored DO range values, whereas, the technical document lists a minimum of 4. The 2013 results summary contained in your powerpoint (Slide 25) show that no diurnal DO range maxima exceeded 6.8 mg/l for ALU attaining streams (n=7). While I understand this is a small sample size and DEP needs to make sure a result is reproducible, the current data suggests good streams do not exceed a diel delta of 7, therefore I think two 24 hour delta DO's of greater than 7 in a one year period would be sufficient documentation for a nutrient listing.

- **Tier 2 Benchmark Dataset**- As you had mentioned in your talk, having a DO dataset that coincided with the WQN periphyton work (2005-2006) would have been ideal for developing the nutrient impairment assessment protocol. Assuming the protocol will primarily be used by DEP to collect nutrient, macroinvertebrate, and DO data in ALU impaired streams, DEP should also consider collecting DO data at ALU attaining WQN stations. Additional data in ALU impaired streams that failed the Tier 1 screening and ALU attaining streams that pass the Tier 1 screening will provide a larger dataset for a reevaluation of the assessment methodology in the future.

- **Seasonality –** In my limited experience, the index period for the largest delta DO at a given station is in the spring (leaf-off, high PAR), during stable flow conditions (March-April). Have you examined the Tier 2 data to see if a summer/fall (June-Sept.) would have lower delta DO benchmarks than spring? Under the current protocol I think I would want to complete my assessment work in March and April when, because of increased light and possibly lower grazer densities, delta DO maxima are greater. If the method included a seasonality component (lower benchmarks for summer) this might increase the biologist's flexibility for when nutrient assessment survey work can be done.

- **DO Rate of Change** – I would like to see CO examine the range of mid-day (1100hr-1500hr) DO change per unit time for the diel oxygen data that is part of your Tier 2 assessment. I would expect significant differences in the DO change rate (mg/l hr) between nutrient impaired and nutrient unimpaired streams. For example on 4/7/2013 between 1100hr and 1500hr Cooks Creek (nutrient unimpaired) had a DO change rate of -0.15 mg/l hr, whereas, the Wissahcikon at Rt 73 had a 1.9 mg/l hr DO change rate (attached excel file). Because of the large number of stream reaches that DEP will need to assess for nutrient impairment, understanding expected DO rates of change in nutrient impaired and unimpaired waters would be valuable to the field biologist when determining sites for Tier 2 assessment. This rate of change data, if informative, could be made part of this protocol or included in the ICE methods document.

- **2013 Dataset Nutrient Impairment Assessment Results Summary (Powerpoint Slide 25) –** I would recommend including the table presented in Slide 25 in the technical document to show Tier 2 benchmarks and impairment decisions for the streams included in the dataset.

- **Concluding Paragraph –** Consider inserting the word natural in the following sentence : "The assessment takes into consideration that there may be cases where a given waterbody may be subject to elevated nutrient levels, but due to **natural** physical and chemical characteristics such as ……these nutrients may, or may not, affect the primary productivity and dissolved oxygen characteristics of the waterway to a degree that ultimately results in non-attainment of ALU". Other stressors, for example water flow variability and resultant siltation and scour associated with stormwater my make it difficult to isolate nutrients as a cause of impairment using the DO benchmarks. That doesn't mean that nutrients aren't contributing towards impairment in those waters. I think DEP needs to be cautious excluding pollutants as causes that may be masked by other pollution or pollutants. Delta DO may be one of several nutrient response criteria that should be examined in stream reaches where multiple stressors are evident. This would be another reason why developing nutrient criteria and multiple response indicators of nutrient enrichment are important.

- **ALU Attaining Score = 50** – The development of Tier 1 TN and TP benchmarks relies on linear regression, using an IBI score of 50 for the ALU attaining threshold. Streams scoring >50 may be impaired based on the screening questions that are part of the IBI protocol. I understand why you used 50, but it may not be the most conservative number.

- **Table 10, Cooks Creek** – Cooks Creek is ALU impaired because it is protected as EV.

- **Table 6, Macro IBI Score = 49** – The response variable Macro IBI for a TP predictor variable of 0.10 is 49.8. Consider not rounding.

let me know if you have any questions relative to my comments or would like to discuss,

thanks,

alan

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